CLAIMS

1. Scanning apparatus operable in the microwave, mm-wave sub mm-wave (TeraHerz) and infrared ranges and comprising a support structure, a first reflective disc or mirror which is mounted in said support structure for rotation relative to the support structure about a first axis, a second reflective disc or mirror which is mounted in said support structure for rotation relative to the support structure about a second axis, the arrangement being such that radiation from a scene being scanned can reach a reflective surface of the first disc or mirror to be reflected thereby onto a reflective surface of the second disc or mirror, to be reflected by the latter, in turn, onto a further part of the apparatus incorporating a receiver or receivers for such radiation, and wherein said reflective surface of the first disc or mirror has an axis of rotational symmetry, (or a normal where said surface is planar), tilted at a small angle relative to said first axis and wherein said reflective surface of the second disc or mirror has an axis of rotational symmetry (or a normal where said surface is planar) tilted at a small angle relative to said second axis, and driving means for said discs or mirrors arranged to drive these in respective opposite senses.

2. Scanning apparatus as claimed in claim 1, wherein said first and second reflective discs or mirrors are both concave mirrors, arranged with their concave sides facing one another and wherein a wire grid polariser is located between the mirrors inclined at an angle with respect to the two mirrors so as to receive radiation, from a scene being scanned, arriving transversely with respect to said first and second axes and to reflect a plane polarised component of such radiation towards said first mirror, and wherein a quarter wave plate, Faraday rotator or equivalent device is located between said first mirror and said wire grid polariser, whereby the radiation passing to said first mirror and reflected thereby towards said second mirror has its

polarisation direction shifted through 90 degrees in passing twice through said quarter wave plate, Faraday rotator or equivalent device, and can thus pass through said wire grid polariser to said second mirror to be focused by said second mirror onto a radiation detector or receiver.

3. Apparatus according to Claim 2 wherein a further Faraday rotator or quarter wave plate or equivalent device is located between said wire grid polariser and said second mirror, whereby radiation passing through said second mirror and reflected thereby towards said first mirror has its polarisation shifted through 90° in passing twice through said second quarter wave plate, Faraday rotator or equivalent device and is reflected by said wire grid polariser, in a direction away from the scene being scanned, towards a radiation detector or receiver.

4. Apparatus according to Claim 2 wherein said second mirror is arranged to direct said radiation to said radiation detector or receiver indirectly, by directing said radiation again through said quarter wave plate, Faraday rotator or equivalent device to said first mirror, to be reflected again, in turn, by said first mirror.

5. Apparatus according to Claim 4 arranged so that after the second reflection by said first mirror and the subsequent passage through the first quarter wave plate, Faraday rotator or equivalent device, the radiation is reflected again by said wire grid polariser, towards said radiation detector or receiver.

6. Scanning apparatus operable in the microwave, mm-wave, sub mm-wave (TeraHerz) and infrared ranges and comprising a first support structure and a reflective disc or mirror which is mounted in said first support structure for rotation relative to the first support structure about a first axis and wherein the reflective surface of the first disc or mirror has an axis of rotational symmetry, (or a normal where said surface is planar), tilted at an angle

relative to said first axis and in which said first support structure is itself mounted for rotation with respect to a second support structure about a second axis inclined with respect to said first axis at the same angle as that at which said axis of rotational symmetry or normal is tilted relative to said first axis, the apparatus including means for rotating said reflective disc or mirror on or in said first support structure about said first axis at a first rate relative to said second support structure and means for rotating said first support structure, relative to said second support structure about said second axis at the same rotation rate as said first rate but in the opposite rotational sense from that in which said reflective disc or mirror is rotated, whereby said reflective disc or mirror can effect a back and forth linear scan in a field of view.

7. Apparatus according to Claim 6 in combination with further means for effecting an orthogonal scan at a different rate in a field of view to produce a two-dimensional raster scan of the field of view.

8. A scanning apparatus operable in the microwave, mm-wave, sub mm-wave (TeraHerz) and infrared ranges and comprising a support structure, a primary drum which is mounted in said support structure for rotation relative to the support structure about a central axis of the primary drum, said primary drum being hollow and of rectangular polygonal form to provide a number of sides or facets each adapted to transmit such radiation which is plane polarised in a first direction at 45° with respect to the rotary axis of the drum and to reflect radiation which is plane polarised in a direction at 45° to the rotary axis of the drum and perpendicular to the said first polarisation direction, such radiation emanating from a field of view of the apparatus, being a field of view which is fixed with respect to said supporting structure, (as opposed to rotating with the primary drum), the arrangement being such that radiation passing into the drum through whichever said side of the drum is currently facing said field of view and passing towards the diametrically opposite side will be plane polarised with a polarisation direction such as to

be reflected back by said diametrically opposite side towards the rotary axis of the drum, each said polygon side being configured so as to act, when reflecting such radiation striking that side from within the drum, as a concave mirror, to focus the radiation towards a receiver assembly which includes a radiation detector for such radiation.

9. Apparatus according to Claim 8 in which said radiation detector is stationary with respect to said support structure and said receiver assembly includes means whereby the radiation reflected from such diametrically opposite side of the rotating drum reaches said radiation detector as a substantially stationary cone.

10. Apparatus according to Claim 8 in which said receiver assembly includes a radiation reflective member mounted within the primary drum for rotation, in said support structure, about an axis coincidental with or parallel with said central axis of the primary drum, the apparatus including means for rotating said radiation reflective member at one half the speed of the primary drum, and in the same rotational sense, said radiation reflector having a plurality of radiation reflective facets and being such that, in section in a plane perpendicular to its rotary axis, said reflective facets define a regular polygon with twice as many sides as the primary drum, said receiver assembly further including means for receiving radiation reflected from said radiation reflective member, and for directing radiation so received to said radiation detector.

11. Apparatus according to Claim 10 wherein said means for receiving radiation reflected from said radiation reflective member is located outside the primary drum and wherein said radiation reflective member is arranged to reflect such radiation, to said means for receiving, through the sides of the primary drum, means being provided within the drum and interposed between said radiation reflective member and said means for receiving for rotating the polarisation direction of such radiation through 90° to pass through said sides of the primary drum.

12. Apparatus according to Claim 10 wherein said radiation reflective member comprises a plurality of pairs of reflective facets, one facet of each pair being disposed further along said axis of the reflective member than the other, the number of such pairs being twice the number of facets of the primary drum, and wherein the facets of each pair are so arranged that radiation directed onto one of said facets after reflection from a said side of the primary drum will be reflected onto the other facet of the pair to be reflected thereby through the sides of the primary drum, to said means for receiving radiation.

13. Apparatus according to Claim 12, wherein the two facets of each said pair are perpendicular to one another.

14. Apparatus according to Claim 13 wherein the two facets of each said pair are inclined at opposite 45° angles to the rotary axis of said radiation reflective member.

15. Apparatus according to Claim 10 wherein said means for receiving radiation comprises an element, herein referred to as a transreflector, mounted within the primary drum and arranged not to obstruct plane polarised radiation reflected from a said facet of the primary drum towards said radiation reflective member but to reflect directly or indirectly to said radiation sensing means, radiation reflected onto said transreflector by said radiation reflective member.